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Application Number	09/654,516
Filing Date	September 1, 2000
First Named Inventor	Louise FARRAND et al.
Examiner Name	Taylor V. Oh
Group / Art Unit	1625
Attorney Docket No.	MERCK-2155

TOTAL AMOUNT OF PAYMENT (\$) 330

METHOD OF PAYMENT (check one)		FEE CALCULATION (continued)	
1. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge indicated fees and credit any over payments to: Deposit Account Number: 13-3402 Deposit Account Name: Millen, White, Zelano & Branigan, P.C. <input checked="" type="checkbox"/> Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17 <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27		3. ADDITIONAL FEES	
2. <input checked="" type="checkbox"/> Payment Enclosed: <input checked="" type="checkbox"/> Check <input type="checkbox"/> Credit card <input type="checkbox"/> Money Order <input type="checkbox"/> Other			
FEE CALCULATION			
1. BASIC FILING FEE			
Large Entity Fee Code	Small Entity Fee Code	Fee Description	Fee Paid
1001	2001	Utility filing fee	
1002	2002	Design filing fee	
1003	2003	Plant filing fee	
1004	2004	Reissue filing fee	
1005	2005	Provisional filing fee	
SUBTOTAL (1)			(\$ 0)
2. EXTRA CLAIM FEES			
Total Claims	-20**	Extra Claims	Fee from below
Independent Claims	-3**		
Multiple Dependent			
Large Entity Fee Code	Small Entity Fee Code	Fee Description	Fee Paid
1202	2202	Claims in excess of 20	
1201	2201	Independent claims in excess of 3	
1203	2203	Multiple dependent claim, if not paid	
1204	2204	** Reissue independent claims over original patent	
1205	2205	** Reissue claims in excess of 20 and over original patent	
SUBTOTAL (2)			(\$ 0)
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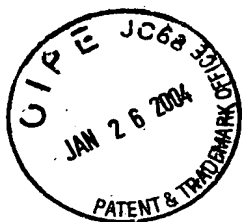
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Louise FARRAND et al.

Confirmation No.: 6056

Serial No.: 09/654,516

Examiner: Taylor V. Oh

Filed: September 1, 2000

Group Art Unit: 1625

Title: MULTIREACTIVE POLYMERIZABLE MESOGENIC COMPOUNDS

BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Mail Stop Appeal Brief - Patents

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

This is an appeal from the decision of the Examiner finally rejecting claims 1-10 of the above-identified application.

(1) REAL PARTY IN INTEREST

The application is assigned of record to Merck Patent Gesellschaft mit beschränkter Haftung, who is the real party in interest herein.

(2) RELATED APPEALS AND INTERFERENCES

Appellants, their legal representative and the assignee are not aware of any related appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the instant appeal.

(3) STATUS OF THE CLAIMS

Claims rejected: Claims 1-10
Claims allowed: (none)
Claims canceled: (none)
Claims withdrawn: Claims 11-17 (see following regarding claim 17)
Claims on Appeal: Claims 1-10 (and 17? See following regarding claim 17)

A copy of all the claims is in the attached Appendix.

Regarding claim 17, the Final Office Action mailed July 24, 2003, indicated this claim to be withdrawn from consideration pursuant to the restriction requirement. However, a reading of the claim (see Appendix) should make it quite clear that it belongs in the elected Group I, multireactive polymerizable mesogenic compound, of the restriction requirement. Claim 17 defines a compound within the compounds of claim 8, on appeal, which is in the elected group. Claim 17 is identical to claim 9 (in the elected Group) except its dependent on claim 8 (also in the elected Group). Claim 17 is not directed to a composition, polymer or article which were the restricted Groups II, III and IV. Appellants, thus, urge that the Examiner indicate in the Examiner's Answer that this claim is not withdrawn and should also be considered on appeal. The below arguments assume this will be done.

(4) STATUS OF AMENDMENTS AFTER FINAL

No amendments after the Final Rejection have been proposed by Appellants. Although the Advisory Action of October 31, 2003, states that appellants filed an

Amendment after the Final Rejection, in fact, this was merely a Request for Reconsideration and no amendments were requested.

(5) SUMMARY OF THE INVENTION

The invention of the claims on appeal is directed to multireactive polymerizable mesogenic compounds of formula I



as defined, for example, at page 6, line 5, to page 7, line 5, of the disclosure. These compounds contain the mesogenic group, MG, which is connected with liquid crystal properties, and at least two polymerizable groups, P, in the R² group. Thus, the compounds are termed multireactive polymerizable mesogenic compounds because they have more than one reactive group which allows their polymerization into liquid crystal polymers (LCP). See, e.g., page 1, lines 1-13; page 1, line 35, to page 2, line 17; and page 4, lines 5-9. Generally, liquid crystal polymers are well known for a variety of uses, particularly to provide optical elements, such as polarizers and filters, and in liquid crystal displays. The compounds of the claims on appeal provide polymers for these well known uses. See, e.g., page 1, lines 15-25, and page 7, lines 16-24.

(6) ISSUES

1. Whether or not the specification provides sufficient information to allow one of ordinary skill in the art to practice the invention, i.e., to make the claimed compounds, without undue experimentation and, thus, whether or not claims 1-10, on appeal, are properly rejection under 35 U.S.C. § 112, first paragraph, for lack of enablement (how to make).

2. Whether or not the term “a chiral or achiral alkyl radical” used in claim 1, on appeal, is indefinite and thus whether or not claims 1-10 are properly rejected under 35 U.S.C. § 112, second paragraph.

(7) GROUPING OF THE CLAIMS

As to Issue 1 (enablement, how to make), for the reasons given below in Appellants’ Arguments, the claims on appeal are grouped as follows:

Claims 1, 3, 6, 7 and 9, on appeal, are grouped together.

Claim 2, on appeal, is separately grouped.

Claim 4, on appeal, is separately grouped.

Claims 5 and 8, on appeal, (and 17) are separately grouped together.

Claim 10, on appeal, is separately grouped.

As to Issue 2 (definiteness), all the claims on appeal are grouped together.

(8) APPELLANTS’ ARGUMENTS

1a. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claims 1, 3, 6, 7 and 9, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of these claims under 35 U.S.C. § 112, first paragraph, is not supported.

Legally, the burden lies with the PTO to prove lack of an enabling disclosure. The PTO has the burden of providing evidence or objective reasoning substantiating the allegation that the enabling disclosure is not commensurate in scope with the claims. See, e.g., In re Marzocchi et al., 169 USPQ 367 (CCPA 1971), stating:

“.. a specification disclosure which contains a teaching of the manner and process of making and using the invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented *must* be taken as in compliance with the enabling requirement of the first paragraph of § 112 *unless* there is reason to doubt the objective truth of the statements contained therein.”,

and further,

“..it is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain *why* it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement.” (emphasis original).

Even when the factors recited in In re Wands, 8 USPQ2d 1400 (Fed. Cir. 1988), are applied (as done in the initial Office Action mailed February 11, 2003), the ultimate burden of proof rests with the PTO.

The instant disclosure contains a description of making the compounds which corresponds to the scope of the claims. Thus, at page 20, lines 23-29, the specification states that:

“The inventive compounds of formula I can be synthesized according to or in analogy to methods which are known per se and which are described in standard works of organic chemistry such as ...”

Then, in the following 7 pages it describes 16 generally applicable schemes for making compounds within the claimed scope. Additionally, it provides 41 specific examples of preparing particular species within the claimed scope which provide a representative demonstration of how to make various types of compounds within the claimed scope. Although the Office Actions did not allege lack of enablement for using the invention, analogous reasoning applies and the specification provides adequate description of the use of the whole scope of claimed compounds. See, e.g., page 4, line 5 to page 5, line 22, and page 7, lines 6-24, of the specification.

The Examiner has not provided sufficient reasons to shed doubt on the accuracy of appellants' statement in the specification that the compounds of formula I can be prepared and used in a way known to one of ordinary skill in the art, for example, using guidance from the general schemes and specific examples. Nor has any objective evidence been provided which would shed doubt on the accuracy of appellants' disclosure or give any specific indication that preparing the compounds based on what was known by one of ordinary skill in the art and the guidance given in the specification would require undue experimentation.

It would appear that the primary basis alleged for supporting the non-enablement rejection is that the claim scope is considered very broad. It is urged that breadth alone is not a proper basis for rejection under 35 U.S.C. § 112, first paragraph. The breadth of the claim should be limited only by the prior art – none having been applied against the instant claims.

Further, it is alleged that there are not working examples for every compound within the claimed scope. Again, the law is quite clear that examples of every embodiment are not required; see MPEP § 2164.03 – supported by numerous court decisions. Appellants' disclosure complies with the statement in the MPEP that:

“For a claimed genus, representative examples together with a statement applicable to the genus as a whole will ordinarily be sufficient if one skilled in the art (in view of level of skill, state of the art and the information in the specification) would expect the claimed genus could be used in that manner without undue experimentation.”

The 16 general schemes and 41 specific examples in the instant specification are a sufficiently representative showing for making compounds of the entire scope of the claimed genus. Based thereon and on the knowledge in the art, one of ordinary skill in the art would expect that the claimed genus of compounds could be made without undue experimentation. Additionally, no objective reasoning has been provided as to why the 16 general schemes and 41 specific examples of preparing particular species within the claimed scope would not

provide a representative demonstration of how to make various types of compounds within the claimed scope.

For enablement, the disclosure and examples are presented to and viewed in the eye of someone of ordinary skill in this particular art. The art of polymerizable mesogenic materials, particularly liquid crystal materials, is well established and one of ordinary skill in this art is well versed in the nature of polymerizable groups, mesogenic groups and chiral or achiral alkyl groups in this art and how to provide compounds containing them. The well established nature of the art and the art-recognized meaning of the terms alleged in the Office Action to be non-enabled is demonstrated, for example, by the Onishi patent (U.S. Patent No. 5,750,213, patented before appellants' priority date) of record herein. See, e.g., col. 7, line 57, to col. 8, line 46, of Onishi, describing the nature of polymerizable groups and mesogen groups in compounds for making liquid crystal polymers.

The rejection particularly points to the terms "polymerizable group," "non-polymerizable group," and "mesogenic group." As evidenced by the Onishi patent, discussed above, the meanings of these terms were known in the art. As to the term "non-polymerizable groups," see the discussion in Issue Ib. below. Based on the specification and their knowledge of the art, one of ordinary skill in the art could practice the entire scope of the instant claimed invention by carrying out only routine, i.e., not undue, experimentation. The Wands standard sets forth non-enablement where there is "undue" experimentation; it does not require that no experimentation at all be necessary to carry out the invention. The Office Actions appear to indicate that all compounds within the claimed scope must be exemplified to show enablement. See, e.g., page 4, first paragraph, of the Final Office Action stating: "the specification provides no evidence of producing all the possible multireactive polymerizable mesogenic compounds according to Scheme[s] 1-16 in the specification" and

sentence bridging pages 4-5 of the Final Office Action stating that only the particular examples shown for the polymerizable group, non-polymerizable group and mesogenic group are reasonably enabled by the disclosure. It is believed that these statements demonstrate application of an incorrect standard, i.e., a standard by which every possible compound in the claims' scope must be exemplified and, thus, one of ordinary skill in the art would require no experimentation, at all, to practice the invention. The correct standard, however, is that some experimentation is acceptable as long as it is not undue. Given the knowledge in the art here, the experimentation required would not be undue.

Looking at the eight Wands factors referred to in the initial Office Action, appellants briefly summarize as follows:

- 1) The quantity of experimentation required - a not undue amount given the representative examples and knowledge of those of ordinary skill in the art;
- 2) The amount of direction or guidance provided - the sixteen different general schemes for preparing the compounds and 41 specific examples provide a wealth of guidance;
- 3) The presence or absence of working examples - such examples, i.e., 41 of them, are clearly present;
- 4) The nature of the invention - a key feature of the invention is the positioning of at least two polymerizable groups in the R² group, i.e., it is the positioning of such groups, not their specific structure or manner of making, which provides this aspect of the invention;
- 5) The state of the prior art - as discussed, the state of the prior art (e.g., Onishi patent) was such that one of ordinary skill in the art was well aware of what polymerizable groups, non-polymerizable groups and mesogenic groups would be useful in making the compounds and would be well aware of how to make compounds containing them;

6) The relative skill of those in the art - the skill was certainly sufficient to prepare compounds with polymerizable groups, non-polymerizable groups and mesogenic groups as recited in the claims, given the guidance of the specification;

7) The predictability of the art - the art of compounds to provide liquid crystal polymers was well established and not particularly unpredictable; and

8) The breadth of the claims - the claims are fairly broad as to the nature of the polymerizable groups, non-polymerizable groups and mesogenic groups, but given the above factors, all weighing in favor of enablement, it is urged that their breadth alone is not sufficient for the PTO to meet its burden of proving non-enablement.

For all of the above reasons, it is urged that the rejection under 35 U.S.C. § 112, first paragraph, for non-enablement is not supported and should be reversed.

1b. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claim 2, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of this claim under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 2, on appeal, recites that “R¹ is a non-polymerizable group.” This claim is addressed separately because the initial rejection and final rejection specifically pointed out the term “non-polymerizable group” as not being enabled. But claim 2 cannot be viewed in a vacuum. Claim 2 is dependent on claim 1 and, thus, incorporates the limitations thereof. Claim 1 defines R¹ as being certain particular groups (which the initial Office Action admits as being enabled) or groups as defined for R² or P-(Sp-X)_n-. The R² or P-(Sp-X)_n- groups are

clearly polymerizable groups since they all contain at least one group P. Claim 2 is thus directed to the embodiments wherein R^1 is one of the stated groups for R^1 in claim 1 and not a R^2 or $P-(Sp-X)_n$ - group. R^1 in claim 2 is not “all the non-polymerizable groups known in the field of organic chemistry” as stated in the initial Office Action (page 5). Such a definition of R^1 would make it broader than claim 1 upon which it depends, which is not a proper reading of the claim. The non-polymerizable groups for R^1 in claim 2 are the specifically stated groups of the definition of R^1 in claim 1, which were never indicated by the Examiner to be non-enabled. These groups are well known in this art and it would be well within the ordinary skill in the art to make the claimed compounds with such R^1 groups. Thus, the “non-polymerizable group” term in claim 2 does not provide any basis for a rejection under 35 U.S.C. § 112, first paragraph.

1c. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claim 4, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of this claim under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 4 provides a specific formula defining the mesogenic group, MG. If it is concluded that the MG term in claim 1 is not enabled, it is urged that this claim, more precisely defining the MG term, would be enabled. The initial Office Action (page 5) appeared to agree that compounds with MG groups as defined by this formula were enabled by the specification. As discussed above, the representative examples in the specification and the knowledge of one of ordinary skill in the art are even more representative of how to make

compounds with these more precisely defined MG groups. Thus, as to the MG, mesogenic group, term, the rejection of claim 4, on appeal, for lack of enablement under 35 U.S.C. § 112, first paragraph, is not supported and should be reversed.

1d. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claims 5, 8 and 17, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of these claims under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 5 (and claims 8 and 17 ultimately dependent thereon) provides a specific formula defining the polymerizable group, P. If it is concluded that the P term in claim 1 is not enabled, it is urged that these claims, more precisely defining the P term, would be enabled. The initial Office Action (page 4) appeared to agree that compounds with P groups as defined by this formula were enabled by the specification. As discussed above, the representative examples in the specification and the knowledge of one of ordinary skill in the art are even more representative of how to make compounds with these more precisely defined P groups. Thus, as to the P, polymerizable group, term, the rejection of claims 5, 8 and 17, on appeal, for lack of enablement under 35 U.S.C. § 112, first paragraph, is not supported and should be reversed.

1e. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claim 10, on appeal (i.e., how to make the claimed

compounds), without undue experimentation and, thus, the rejection of this claim under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 10 provides a list of particular polymerizable groups, P. If it is concluded that the P term in claim 1 is not enabled, it is urged that this claim, more precisely defining the P term, would be enabled. The initial Office Action (page 4) appeared to agree that compounds with P groups as defined by this claim were enabled by the specification. As discussed above, the representative examples in the specification and the knowledge of one of ordinary skill in the art are even more representative of how to make compounds with these more precisely defined P groups. Thus, as to the P, polymerizable group, term, the rejection of claim 10, on appeal, for lack of enablement under 35 U.S.C. § 112, first paragraph, is not supported and should be reversed.

2. The term “a chiral or achiral alkyl radical” as used in claim 1, on appeal, is not indefinite and thus the rejection of claims 1-10 under 35 U.S.C. § 112, second paragraph, is not supported.

The rejection of claims 1-10 under 35 U.S.C. § 112, second paragraph, was based on the recitation of “a chiral or achiral alkyl radical.” This term, as recited in claim 1, is not indefinite. In fact, defining the alkyl radical as being “chiral or achiral” is somewhat superfluous but this does not render it indefinite. The terms chiral and achiral are mutually exclusive and cover all possibilities, i.e., all alkyl groups are either chiral or achiral. The term “achiral” means it is not chiral. Thus, the recitation “a chiral or achiral alkyl radical” encompasses all the alkyl radicals otherwise defined by R¹. This meaning would be evident

to one of ordinary skill in the art reading the instant disclosure and claims. The recitation of “chiral and achiral” is merely a remnant of the disclosure made with the intent to make sure both types of alkyl radicals were encompassed, i.e., similar to claims reciting “branched or unbranched” alkyl. The meaning is clear to those in the art and it is not improper.

The discussion in the Office Action regarding spatial arrangements, i.e., including S or R configuration radicals, is not seen to be relevant to the inquiry. The claims recite nothing about R or S configuration. The chiral term encompasses alkyl radicals which are chiral in either of these configurations since it is not limited to any particular chiral configuration. One of ordinary skill in the art (or in any chemical art) knows well what defines a chiral (and, thus, an achiral) radical. Particularly when the term is applied just to alkyl radicals, distinguishing between alkyl radicals which are chiral or achiral (although unnecessary since the claim encompasses both) is clear to the ordinarily skilled chemist.

For these reasons, the claims on appeal are not rendered indefinite by the “chiral or achiral alkyl radical” term and the rejection under 35 U.S.C. § 112, second paragraph, should be reversed.

(9) CONCLUSION

For all of the above reasons, it is urged that the decision of the Examiner finally rejecting claims 1-10, on appeal, is in error and should be reversed.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,



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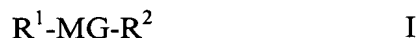
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Date: January 26, 2004

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APPENDIX OF CLAIMS

1. A multireactive polymerizable mesogenic compound of formula I



wherein

R^1 is halogen, CN, OCN, NCS, NO_2 or a chiral or achiral alkyl radical with 1 to 30 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, optionally one or more non-adjacent CH_2 groups being replaced, in each case independently from one another, by -O-, -S-, -NH-, -N(CH_3)-, -CO-, -COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C \equiv C- in such a manner that oxygen atoms are not linked directly to one another, or alternatively has one of the meanings of R^2 or is P-(Sp-X) $_n$,

P is a polymerizable group,

Sp is a spacer group with 1 to 25 C atoms,

X is -O-, -S-, -CO-, -COO-, -OCO-, -OCO-O-, -CO-NH-,
-NH-CO-, -OCH $_2$ -, -CH $_2$ O-, -SCH $_2$ -, -CH $_2$ S-, -CH=CH-COO-, -OOC-CH=CH-
or a single bond,

n is 0 or 1,

MG is a mesogenic group, and

R^2 is straight-chain or branched alkyl with 1 to 25 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, optionally one or more non-adjacent CH_2 groups being replaced, in each case independently from one another, by -O-, -S-, -NH-, -N(CH_3)-, -CO-, -COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C \equiv C- in such a manner that oxygen atoms are not linked directly to one another, and which is substituted with at least two identical or different groups P.

2. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^1 is a non-polymerizable group.
3. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^1 has one of the meanings of R^2 .
4. A multireactive polymerizable mesogenic compound according to claim 1, wherein MG is of formula II



wherein

Z is -O-, -S-, -CO-, -COO-, -OCO-, -CO-NH-, -NH-CO-,
-CH₂CH₂-, -OCH₂-, -CH₂O-, -SCH₂-, -CH₂S-, -CH=CH-,
-CH=CH-COO-, -OCO-CH=CH-, -C≡C- or a single bond,

A^1 and A^2 are each independently 1,4-phenylene in which, in addition, one or more CH groups are optionally replaced by N; 1,4-cyclohexylene in which, in addition, one or two non-adjacent CH₂ groups are optionally replaced by O and/or S; 1,4-cyclohexenylene; 1,4-bicyclo(2,2,2)octylene; piperidine-1,4-diyl; naphthalene-2,6-diyl; decahydronaphthalene-2,6-diyl; or 1,2,3,4-tetrahydro-naphthalene-2,6-diyl; all these groups optionally being unsubstituted, mono- or polysubstituted with F, Cl, OH, CN, NO₂ or alkyl, alkoxy, alkylcarbonyl or alkoxy carbonyl groups having 1 to 7 C atoms wherein one or more H atoms may be substituted by F or Cl, and

m is 1, 2 or 3.

5. A multireactive polymerizable mesogenic compound according to claim 1, wherein P is selected from $\text{CH}_2=\text{CW}-\text{COO}-$, $\text{WCH}=\text{CH}-\text{O}-$, $\text{CH}_2=\text{CH}-\text{Phenyl}-(\text{O})_k-$ and

$\text{WHC} \begin{array}{c} \diagup \text{O} \diagdown \\ \text{---} \end{array} \text{CH}-$, with W being H, CH_3 or Cl and k being 0 or 1.

6. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^2 is substituted with 2, 3, 4 or 5 identical or different polymerizable groups P.

7. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^2 is a group of one of the following formulae

$-\text{X-alkyl}-\text{CHP}^1-\text{CH}_2-\text{CH}_2\text{P}^2$ Ia

$-\text{X-alkyl}-\text{C}(\text{CH}_2\text{P}^1)(\text{CH}_2\text{P}^2)-\text{CH}_2\text{P}^3$ Ib

$-\text{X-alkyl}-\text{CHP}^1\text{CHP}^2-\text{CH}_2\text{P}^3$ Ic

$-\text{X-alkyl}-\text{C}(\text{CH}_2\text{P}^1)(\text{CH}_2\text{P}^2)-\text{C}_a\text{H}_{2a+1}$ Id

$-\text{X-alkyl}-\text{CHP}^1-\text{CH}_2\text{P}^2$ Ie

$-\text{X-alkyl}-\text{CHP}^1\text{P}^2$ If

$-\text{X-alkyl}-\text{CP}^1\text{P}^2-\text{C}_a\text{H}_{2a+1}$ Ig

$-\text{X-alkyl}-\text{C}(\text{CH}_2\text{P}^1)(\text{CH}_2\text{P}^2)-\text{CH}_2\text{OCH}_2-\text{C}(\text{CH}_2\text{P}^3)(\text{CH}_2\text{P}^4)\text{CH}_2\text{P}^5$ Ih

$-\text{X-alkyl}-\text{CH}((\text{CH}_2)_a\text{P}^1)((\text{CH}_2)_b\text{P}^2)$ Ii

$-\text{X-alkyl}-\text{CHP}^1\text{CHP}^2-\text{C}_a\text{H}_{2a+1}$ Ik

wherein

alkyl is straight-chain or branched alkylene with 1 to 12 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, one or more non-adjacent CH_2 groups optionally being replaced, in each case independently from one another, by $-\text{O}-$, $-\text{S}-$, $-\text{NH}-$, $-\text{N}(\text{CH}_3)-$, $-\text{CO}-$,

-COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C≡C- in such a manner that oxygen atoms are not linked directly to one another,

a and b are identical or different integers from 0 to 6,

X has one of the meanings given in formula I, and

P¹ to P⁵ independently have one of the meanings of P given in formula I.

8. A multireactive polymerizable mesogenic compound according to claim 5, wherein

R² is a group of one of the following formulae

-X-alkyl-CHP¹-CH₂-CH₂P² Ia

-X-alkyl-C(CH₂P¹)(CH₂P²)-CH₂P³ Ib

-X-alkyl-CHP¹CHP²-CH₂P³ Ic

-X-alkyl-C(CH₂P¹)(CH₂P²)-C_aH_{2a+1} Id

-X-alkyl-CHP¹-CH₂P² Ie

-X-alkyl-CHP¹P² If

-X-alkyl-CP¹P²-C_aH_{2a+1} Ig

-X-alkyl-C(CH₂P¹)(CH₂P²)-CH₂OCH₂-C(CH₂P³)(CH₂P⁴)CH₂P⁵ Ih

-X-alkyl-CH((CH₂)_aP¹)((CH₂)_bP²) Ii

-X-alkyl-CHP¹CHP²-C_aH_{2a+1} Ik

wherein

alkyl is straight-chain or branched alkylene with 1 to 12 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, one or more non-adjacent CH₂ groups optionally being replaced, in each case independently from one another, by -O-, -S-, -NH-, -N(CH₃)-, -CO-,

-COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C≡C- in such a manner that oxygen atoms are not linked directly to one another,

a and b are identical or different integers from 0 to 6,

X has one of the meanings given in formula I, and

P¹ to P⁵ independently have one of the meanings of P given in formula I.

9. A multireactive polymerizable mesogenic compound according to claim 7, wherein alkyl is -(CH₂)_c-, with c being an integer from 1 to 12.

10. A multireactive polymerizable mesogenic compound according to claim 1, wherein each P is independently of each other acrylate, methacrylate, vinyl, vinyloxy, epoxy or p-vinylphenoxy.

11. (Withdrawn) A polymerizable mesogenic composition comprising at least two components, wherein at least one component is a compound according to claim 1.

12. (Withdrawn) A linear or crosslinked polymer obtained by polymerizing a polymerizable mesogenic compound according to claim 1.

13. (Withdrawn) A linear or crosslinked polymer obtained by polymerizing a polymerizable mesogenic composition according to claim 11.

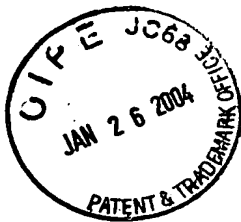
14. (Withdrawn) A polarizer, optical retardation or compensation film, alignment layer, colour filter, holographic element, liquid crystal display, PDLC, polymer

gel, polymer stabilized cholesteric texture (PSCT) display, adhesive, synthetic resins with anisotropic mechanical properties, cosmetic, diagnostic, liquid crystal pigment for decorative and/or security applications, or article for nonlinear optics or optical information storage comprising a compound according to claim 1.

15. (Withdrawn) A polarizer, optical retardation or compensation film, alignment layer, colour filter, holographic element, liquid crystal display, PDLC, polymer gel, polymer stabilized cholesteric texture (PSCT) display, adhesive, synthetic resins with anisotropic mechanical properties, cosmetic, diagnostic, liquid crystal pigment for decorative and/or security applications, or article for nonlinear optics or optical information storage comprising a composition according to claim 11.

16. (Withdrawn) A polarizer, optical retardation or compensation film, alignment layer, colour filter, holographic element, liquid crystal display, PDLC, polymer gel, polymer stabilized cholesteric texture (PSCT) display, adhesive, synthetic resins with anisotropic mechanical properties, cosmetic, diagnostic, liquid crystal pigment for decorative and/or security applications, or article for nonlinear optics or optical information storage comprising a polymer according to claim 12.

17. (Withdrawn) A multireactive polymerizable mesogenic compound according to claim 8, wherein alkyl is $-(CH_2)_c-$, with c being an integer from 1 to 12.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Louise FARRAND et al.

Confirmation No.: 6056

Serial No.: 09/654,516

Examiner: Taylor V. Oh

Filed: September 1, 2000

Group Art Unit: 1625

Title: MULTIREACTIVE POLYMERIZABLE MESOGENIC COMPOUNDS

BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Mail Stop Appeal Brief - Patents

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

This is an appeal from the decision of the Examiner finally rejecting claims 1-10 of the above-identified application.

(1) REAL PARTY IN INTEREST

The application is assigned of record to Merck Patent Gesellschaft mit beschränkter Haftung, who is the real party in interest herein.

(2) RELATED APPEALS AND INTERFERENCES

Appellants, their legal representative and the assignee are not aware of any related appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the instant appeal.

(3) STATUS OF THE CLAIMS

Claims rejected: Claims 1-10
Claims allowed: (none)
Claims canceled: (none)
Claims withdrawn: Claims 11-17 (see following regarding claim 17)
Claims on Appeal: Claims 1-10 (and 17? See following regarding claim 17)

A copy of all the claims is in the attached Appendix.

Regarding claim 17, the Final Office Action mailed July 24, 2003, indicated this claim to be withdrawn from consideration pursuant to the restriction requirement. However, a reading of the claim (see Appendix) should make it quite clear that it belongs in the elected Group I, multireactive polymerizable mesogenic compound, of the restriction requirement. Claim 17 defines a compound within the compounds of claim 8, on appeal, which is in the elected group. Claim 17 is identical to claim 9 (in the elected Group) except its dependent on claim 8 (also in the elected Group). Claim 17 is not directed to a composition, polymer or article which were the restricted Groups II, III and IV. Appellants, thus, urge that the Examiner indicate in the Examiner's Answer that this claim is not withdrawn and should also be considered on appeal. The below arguments assume this will be done.

(4) STATUS OF AMENDMENTS AFTER FINAL

No amendments after the Final Rejection have been proposed by Appellants. Although the Advisory Action of October 31, 2003, states that appellants filed an

Amendment after the Final Rejection, in fact, this was merely a Request for Reconsideration and no amendments were requested.

(5) SUMMARY OF THE INVENTION

The invention of the claims on appeal is directed to multireactive polymerizable mesogenic compounds of formula I



as defined, for example, at page 6, line 5, to page 7, line 5, of the disclosure. These compounds contain the mesogenic group, MG, which is connected with liquid crystal properties, and at least two polymerizable groups, P, in the R² group. Thus, the compounds are termed multireactive polymerizable mesogenic compounds because they have more than one reactive group which allows their polymerization into liquid crystal polymers (LCP). See, e.g., page 1, lines 1-13; page 1, line 35, to page 2, line 17; and page 4, lines 5-9. Generally, liquid crystal polymers are well known for a variety of uses, particularly to provide optical elements, such as polarizers and filters, and in liquid crystal displays. The compounds of the claims on appeal provide polymers for these well known uses. See, e.g., page 1, lines 15-25, and page 7, lines 16-24.

(6) ISSUES

1. Whether or not the specification provides sufficient information to allow one of ordinary skill in the art to practice the invention, i.e., to make the claimed compounds, without undue experimentation and, thus, whether or not claims 1-10, on appeal, are properly rejection under 35 U.S.C. § 112, first paragraph, for lack of enablement (how to make).

2. Whether or not the term "a chiral or achiral alkyl radical" used in claim 1, on appeal, is indefinite and thus whether or not claims 1-10 are properly rejected under 35 U.S.C. § 112, second paragraph.

(7) GROUPING OF THE CLAIMS

As to Issue 1 (enablement, how to make), for the reasons given below in Appellants' Arguments, the claims on appeal are grouped as follows:

Claims 1, 3, 6, 7 and 9, on appeal, are grouped together.

Claim 2, on appeal, is separately grouped.

Claim 4, on appeal, is separately grouped.

Claims 5 and 8, on appeal, (and 17) are separately grouped together.

Claim 10, on appeal, is separately grouped.

As to Issue 2 (definiteness), all the claims on appeal are grouped together.

(8) APPELLANTS' ARGUMENTS

1a. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claims 1, 3, 6, 7 and 9, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of these claims under 35 U.S.C. § 112, first paragraph, is not supported.

Legally, the burden lies with the PTO to prove lack of an enabling disclosure. The PTO has the burden of providing evidence or objective reasoning substantiating the allegation that the enabling disclosure is not commensurate in scope with the claims. See, e.g., In re Marzocchi et al., 169 USPQ 367 (CCPA 1971), stating:

“.. a specification disclosure which contains a teaching of the manner and process of making and using the invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented *must* be taken as in compliance with the enabling requirement of the first paragraph of § 112 *unless* there is reason to doubt the objective truth of the statements contained therein.”,

and further,

“..it is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain *why* it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement.” (emphasis original).

Even when the factors recited in In re Wands, 8 USPQ2d 1400 (Fed. Cir. 1988), are applied (as done in the initial Office Action mailed February 11, 2003), the ultimate burden of proof rests with the PTO.

The instant disclosure contains a description of making the compounds which corresponds to the scope of the claims. Thus, at page 20, lines 23-29, the specification states that:

“The inventive compounds of formula I can be synthesized according to or in analogy to methods which are known per se and which are described in standard works of organic chemistry such as ...”

Then, in the following 7 pages it describes 16 generally applicable schemes for making compounds within the claimed scope. Additionally, it provides 41 specific examples of preparing particular species within the claimed scope which provide a representative demonstration of how to make various types of compounds within the claimed scope. Although the Office Actions did not allege lack of enablement for using the invention, analogous reasoning applies and the specification provides adequate description of the use of the whole scope of claimed compounds. See, e.g., page 4, line 5 to page 5, line 22, and page 7, lines 6-24, of the specification.

The Examiner has not provided sufficient reasons to shed doubt on the accuracy of appellants' statement in the specification that the compounds of formula I can be prepared and used in a way known to one of ordinary skill in the art, for example, using guidance from the general schemes and specific examples. Nor has any objective evidence been provided which would shed doubt on the accuracy of appellants' disclosure or give any specific indication that preparing the compounds based on what was known by one of ordinary skill in the art and the guidance given in the specification would require undue experimentation.

It would appear that the primary basis alleged for supporting the non-enablement rejection is that the claim scope is considered very broad. It is urged that breadth alone is not a proper basis for rejection under 35 U.S.C. § 112, first paragraph. The breadth of the claim should be limited only by the prior art – none having been applied against the instant claims.

Further, it is alleged that there are not working examples for every compound within the claimed scope. Again, the law is quite clear that examples of every embodiment are not required; see MPEP § 2164.03 – supported by numerous court decisions. Appellants' disclosure complies with the statement in the MPEP that:

“For a claimed genus, representative examples together with a statement applicable to the genus as a whole will ordinarily be sufficient if one skilled in the art (in view of level of skill, state of the art and the information in the specification) would expect the claimed genus could be used in that manner without undue experimentation.”

The 16 general schemes and 41 specific examples in the instant specification are a sufficiently representative showing for making compounds of the entire scope of the claimed genus. Based thereon and on the knowledge in the art, one of ordinary skill in the art would expect that the claimed genus of compounds could be made without undue experimentation. Additionally, no objective reasoning has been provided as to why the 16 general schemes and 41 specific examples of preparing particular species within the claimed scope would not

provide a representative demonstration of how to make various types of compounds within the claimed scope.

For enablement, the disclosure and examples are presented to and viewed in the eye of someone of ordinary skill in this particular art. The art of polymerizable mesogenic materials, particularly liquid crystal materials, is well established and one of ordinary skill in this art is well versed in the nature of polymerizable groups, mesogenic groups and chiral or achiral alkyl groups in this art and how to provide compounds containing them. The well established nature of the art and the art-recognized meaning of the terms alleged in the Office Action to be non-enabled is demonstrated, for example, by the Onishi patent (U.S. Patent No. 5,750,213, patented before appellants' priority date) of record herein. See, e.g., col. 7, line 57, to col. 8, line 46, of Onishi, describing the nature of polymerizable groups and mesogen groups in compounds for making liquid crystal polymers.

The rejection particularly points to the terms "polymerizable group," "non-polymerizable group," and "mesogenic group." As evidenced by the Onishi patent, discussed above, the meanings of these terms were known in the art. As to the term "non-polymerizable groups," see the discussion in Issue Ib. below. Based on the specification and their knowledge of the art, one of ordinary skill in the art could practice the entire scope of the instant claimed invention by carrying out only routine, i.e., not undue, experimentation. The Wands standard sets forth non-enablement where there is "undue" experimentation; it does not require that no experimentation at all be necessary to carry out the invention. The Office Actions appear to indicate that all compounds within the claimed scope must be exemplified to show enablement. See, e.g., page 4, first paragraph, of the Final Office Action stating: "the specification provides no evidence of producing all the possible multireactive polymerizable mesogenic compounds according to Scheme[s] 1-16 in the specification" and

sentence bridging pages 4-5 of the Final Office Action stating that only the particular examples shown for the polymerizable group, non-polymerizable group and mesogenic group are reasonably enabled by the disclosure. It is believed that these statements demonstrate application of an incorrect standard, i.e., a standard by which every possible compound in the claims' scope must be exemplified and, thus, one of ordinary skill in the art would require no experimentation, at all, to practice the invention. The correct standard, however, is that some experimentation is acceptable as long as it is not undue. Given the knowledge in the art here, the experimentation required would not be undue.

Looking at the eight Wands factors referred to in the initial Office Action, appellants briefly summarize as follows:

- 1) The quantity of experimentation required - a not undue amount given the representative examples and knowledge of those of ordinary skill in the art;
- 2) The amount of direction or guidance provided - the sixteen different general schemes for preparing the compounds and 41 specific examples provide a wealth of guidance;
- 3) The presence or absence of working examples - such examples, i.e., 41 of them, are clearly present;
- 4) The nature of the invention - a key feature of the invention is the positioning of at least two polymerizable groups in the R² group, i.e., it is the positioning of such groups, not their specific structure or manner of making, which provides this aspect of the invention;
- 5) The state of the prior art - as discussed, the state of the prior art (e.g., Onishi patent) was such that one of ordinary skill in the art was well aware of what polymerizable groups, non-polymerizable groups and mesogenic groups would be useful in making the compounds and would be well aware of how to make compounds containing them;

6) The relative skill of those in the art - the skill was certainly sufficient to prepare compounds with polymerizable groups, non-polymerizable groups and mesogenic groups as recited in the claims, given the guidance of the specification;

7) The predictability of the art - the art of compounds to provide liquid crystal polymers was well established and not particularly unpredictable; and

8) The breadth of the claims - the claims are fairly broad as to the nature of the polymerizable groups, non-polymerizable groups and mesogenic groups, but given the above factors, all weighing in favor of enablement, it is urged that their breadth alone is not sufficient for the PTO to meet its burden of proving non-enablement.

For all of the above reasons, it is urged that the rejection under 35 U.S.C. § 112, first paragraph, for non-enablement is not supported and should be reversed.

1b. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claim 2, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of this claim under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 2, on appeal, recites that "R¹ is a non-polymerizable group." This claim is addressed separately because the initial rejection and final rejection specifically pointed out the term "non-polymerizable group" as not being enabled. But claim 2 cannot be viewed in a vacuum. Claim 2 is dependent on claim 1 and, thus, incorporates the limitations thereof. Claim 1 defines R¹ as being certain particular groups (which the initial Office Action admits as being enabled) or groups as defined for R² or P-(Sp-X)_n-. The R² or P-(Sp-X)_n- groups are

clearly polymerizable groups since they all contain at least one group P. Claim 2 is thus directed to the embodiments wherein R^1 is one of the stated groups for R^1 in claim 1 and not a R^2 or $P-(Sp-X)_n$ -group. R^1 in claim 2 is not "all the non-polymerizable groups known in the field of organic chemistry" as stated in the initial Office Action (page 5). Such a definition of R^1 would make it broader than claim 1 upon which it depends, which is not a proper reading of the claim. The non-polymerizable groups for R^1 in claim 2 are the specifically stated groups of the definition of R^1 in claim 1, which were never indicated by the Examiner to be non-enabled. These groups are well known in this art and it would be well within the ordinary skill in the art to make the claimed compounds with such R^1 groups. Thus, the "non-polymerizable group" term in claim 2 does not provide any basis for a rejection under 35 U.S.C. § 112, first paragraph.

1c. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claim 4, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of this claim under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 4 provides a specific formula defining the mesogenic group, MG. If it is concluded that the MG term in claim 1 is not enabled, it is urged that this claim, more precisely defining the MG term, would be enabled. The initial Office Action (page 5) appeared to agree that compounds with MG groups as defined by this formula were enabled by the specification. As discussed above, the representative examples in the specification and the knowledge of one of ordinary skill in the art are even more representative of how to make

compounds with these more precisely defined MG groups. Thus, as to the MG, mesogenic group, term, the rejection of claim 4, on appeal, for lack of enablement under 35 U.S.C. § 112, first paragraph, is not supported and should be reversed.

1d. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claims 5, 8 and 17, on appeal (i.e., how to make the claimed compounds), without undue experimentation and, thus, the rejection of these claims under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 5 (and claims 8 and 17 ultimately dependent thereon) provides a specific formula defining the polymerizable group, P. If it is concluded that the P term in claim 1 is not enabled, it is urged that these claims, more precisely defining the P term, would be enabled. The initial Office Action (page 4) appeared to agree that compounds with P groups as defined by this formula were enabled by the specification. As discussed above, the representative examples in the specification and the knowledge of one of ordinary skill in the art are even more representative of how to make compounds with these more precisely defined P groups. Thus, as to the P, polymerizable group, term, the rejection of claims 5, 8 and 17, on appeal, for lack of enablement under 35 U.S.C. § 112, first paragraph, is not supported and should be reversed.

1e. The specification provides sufficient information to allow one of ordinary skill in the art to practice the invention of claim 10, on appeal (i.e., how to make the claimed

compounds), without undue experimentation and, thus, the rejection of this claim under 35 U.S.C. § 112, first paragraph, is not supported.

The arguments made as to Issue 1a apply equally here and are incorporated herein by reference.

Claim 10 provides a list of particular polymerizable groups, P. If it is concluded that the P term in claim 1 is not enabled, it is urged that this claim, more precisely defining the P term, would be enabled. The initial Office Action (page 4) appeared to agree that compounds with P groups as defined by this claim were enabled by the specification. As discussed above, the representative examples in the specification and the knowledge of one of ordinary skill in the art are even more representative of how to make compounds with these more precisely defined P groups. Thus, as to the P, polymerizable group, term, the rejection of claim 10, on appeal, for lack of enablement under 35 U.S.C. § 112, first paragraph, is not supported and should be reversed.

2. The term "a chiral or achiral alkyl radical" as used in claim 1, on appeal, is not indefinite and thus the rejection of claims 1-10 under 35 U.S.C. § 112, second paragraph, is not supported.

The rejection of claims 1-10 under 35 U.S.C. § 112, second paragraph, was based on the recitation of "a chiral or achiral alkyl radical." This term, as recited in claim 1, is not indefinite. In fact, defining the alkyl radical as being "chiral or achiral" is somewhat superfluous but this does not render it indefinite. The terms chiral and achiral are mutually exclusive and cover all possibilities, i.e., all alkyl groups are either chiral or achiral. The term "achiral" means it is not chiral. Thus, the recitation "a chiral or achiral alkyl radical" encompasses all the alkyl radicals otherwise defined by R¹. This meaning would be evident

to one of ordinary skill in the art reading the instant disclosure and claims. The recitation of "chiral and achiral" is merely a remnant of the disclosure made with the intent to make sure both types of alkyl radicals were encompassed, i.e., similar to claims reciting "branched or unbranched" alkyl. The meaning is clear to those in the art and it is not improper.

The discussion in the Office Action regarding spatial arrangements, i.e., including S or R configuration radicals, is not seen to be relevant to the inquiry. The claims recite nothing about R or S configuration. The chiral term encompasses alkyl radicals which are chiral in either of these configurations since it is not limited to any particular chiral configuration. One of ordinary skill in the art (or in any chemical art) knows well what defines a chiral (and, thus, an achiral) radical. Particularly when the term is applied just to alkyl radicals, distinguishing between alkyl radicals which are chiral or achiral (although unnecessary since the claim encompasses both) is clear to the ordinarily skilled chemist.

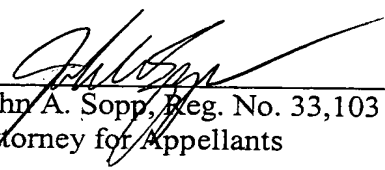
For these reasons, the claims on appeal are not rendered indefinite by the "chiral or achiral alkyl radical" term and the rejection under 35 U.S.C. § 112, second paragraph, should be reversed.

(9) CONCLUSION

For all of the above reasons, it is urged that the decision of the Examiner finally rejecting claims 1-10, on appeal, is in error and should be reversed.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,



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Attorney Docket No.: MERCK-2155

Date: January 26, 2004

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APPENDIX OF CLAIMS

1. A multireactive polymerizable mesogenic compound of formula I



wherein

R^1 is halogen, CN, OCN, NCS, NO_2 or a chiral or achiral alkyl radical with 1 to 30 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, optionally one or more non-adjacent CH_2 groups being replaced, in each case independently from one another, by -O-, -S-, -NH-, -N(CH_3)-, -CO-, -COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C \equiv C- in such a manner that oxygen atoms are not linked directly to one another, or alternatively has one of the meanings of R^2 or is P-(Sp-X) $_n$,

P is a polymerizable group,

Sp is a spacer group with 1 to 25 C atoms,

X is -O-, -S-, -CO-, -COO-, -OCO-, -OCO-O-, -CO-NH-,
-NH-CO-, -OCH $_2$ -, -CH $_2$ O-, -SCH $_2$ -, -CH $_2$ S-, -CH=CH-COO-, -OOC-CH=CH-
or a single bond,

n is 0 or 1,

MG is a mesogenic group, and

R^2 is straight-chain or branched alkyl with 1 to 25 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, optionally one or more non-adjacent CH_2 groups being replaced, in each case independently from one another, by -O-, -S-, -NH-, -N(CH_3)-, -CO-, -COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C \equiv C- in such a manner that oxygen atoms are not linked directly to one another, and which is substituted with at least two identical or different groups P.

2. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^1 is a non-polymerizable group.
3. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^1 has one of the meanings of R^2 .
4. A multireactive polymerizable mesogenic compound according to claim 1, wherein MG is of formula II



wherein

Z is -O-, -S-, -CO-, -COO-, -OCO-, -CO-NH-, -NH-CO-,
-CH₂CH₂-, -OCH₂-, -CH₂O-, -SCH₂-, -CH₂S-, -CH=CH-,
-CH=CH-COO-, -OCO-CH=CH-, -C≡C- or a single bond,

A^1 and A^2 are each independently 1,4-phenylene in which, in addition, one or more CH groups are optionally replaced by N; 1,4-cyclohexylene in which, in addition, one or two non-adjacent CH₂ groups are optionally replaced by O and/or S; 1,4-cyclohexenylene; 1,4-bicyclo(2,2,2)octylene; piperidine-1,4-diyl; naphthalene-2,6-diyl; decahydronaphthalene-2,6-diyl; or 1,2,3,4-tetrahydro-naphthalene-2,6-diyl; all these groups optionally being unsubstituted, mono- or polysubstituted with F, Cl, OH, CN, NO₂ or alkyl, alkoxy, alkylcarbonyl or alkoxy carbonyl groups having 1 to 7 C atoms wherein one or more H atoms may be substituted by F or Cl, and

m is 1, 2 or 3.

5. A multireactive polymerizable mesogenic compound according to claim 1, wherein P is selected from $\text{CH}_2=\text{CW}-\text{COO}-$, $\text{WCH}=\text{CH}-\text{O}-$, $\text{CH}_2=\text{CH}-\text{Phenyl}-(\text{O})_k-$ and $\text{WHC}-\text{CH}-$, with W being H, CH_3 or Cl and k being 0 or 1.

6. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^2 is substituted with 2, 3, 4 or 5 identical or different polymerizable groups P.

7. A multireactive polymerizable mesogenic compound according to claim 1, wherein R^2 is a group of one of the following formulae

-X-alkyl- CHP^1 - CH_2 - CH_2P^2 Ia

-X-alkyl- $\text{C}(\text{CH}_2\text{P}^1)(\text{CH}_2\text{P}^2)-\text{CH}_2\text{P}^3$ Ib

-X-alkyl- $\text{CHP}^1\text{CHP}^2-\text{CH}_2\text{P}^3$ Ic

-X-alkyl- $\text{C}(\text{CH}_2\text{P}^1)(\text{CH}_2\text{P}^2)-\text{C}_a\text{H}_{2a+1}$ Id

-X-alkyl- $\text{CHP}^1-\text{CH}_2\text{P}^2$ Ie

-X-alkyl- CHP^1P^2 If

-X-alkyl- $\text{CP}^1\text{P}^2-\text{C}_a\text{H}_{2a+1}$ Ig

-X-alkyl- $\text{C}(\text{CH}_2\text{P}^1)(\text{CH}_2\text{P}^2)-\text{CH}_2\text{OCH}_2-\text{C}(\text{CH}_2\text{P}^3)(\text{CH}_2\text{P}^4)\text{CH}_2\text{P}^5$ Ih

-X-alkyl- $\text{CH}((\text{CH}_2)_a\text{P}^1)((\text{CH}_2)_b\text{P}^2)$ Ii

-X-alkyl- $\text{CHP}^1\text{CHP}^2-\text{C}_a\text{H}_{2a+1}$ Ik

wherein

alkyl is straight-chain or branched alkylene with 1 to 12 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, one or more non-adjacent CH_2 groups optionally being replaced, in each case independently from one another, by -O-, -S-, -NH-, -N(CH_3)-, -CO-,

-COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C≡C- in such a manner that oxygen atoms are not linked directly to one another,

a and b are identical or different integers from 0 to 6,

X has one of the meanings given in formula I, and

P¹ to P⁵ independently have one of the meanings of P given in formula I.

8. A multireactive polymerizable mesogenic compound according to claim 5, wherein R² is a group of one of the following formulae

-X-alkyl-CHP¹-CH₂-CH₂P² Ia

-X-alkyl-C(CH₂P¹)(CH₂P²)-CH₂P³ Ib

-X-alkyl-CHP¹CHP²-CH₂P³ Ic

-X-alkyl-C(CH₂P¹)(CH₂P²)-C_aH_{2a+1} Id

-X-alkyl-CHP¹-CH₂P² Ie

-X-alkyl-CHP¹P² If

-X-alkyl-CP¹P²-C_aH_{2a+1} Ig

-X-alkyl-C(CH₂P¹)(CH₂P²)-CH₂OCH₂-C(CH₂P³)(CH₂P⁴)CH₂P⁵ Ih

-X-alkyl-CH((CH₂)_aP¹)((CH₂)_bP²) Ii

-X-alkyl-CHP¹CHP²-C_aH_{2a+1} Ik

wherein

alkyl is straight-chain or branched alkylene with 1 to 12 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, one or more non-adjacent CH₂ groups optionally being replaced, in each case independently from one another, by -O-, -S-, -NH-, -N(CH₃)-, -CO-,

-COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -CH=CH- or -C≡C- in such a manner that oxygen atoms are not linked directly to one another,

a and b are identical or different integers from 0 to 6,

X has one of the meanings given in formula I, and

P¹ to P⁵ independently have one of the meanings of P given in formula I.

9. A multireactive polymerizable mesogenic compound according to claim 7, wherein alkyl is -(CH₂)_c-, with c being an integer from 1 to 12.
10. A multireactive polymerizable mesogenic compound according to claim 1, wherein each P is independently of each other acrylate, methacrylate, vinyl, vinyloxy, epoxy or p-vinylphenyloxy.
11. (Withdrawn) A polymerizable mesogenic composition comprising at least two components, wherein at least one component is a compound according to claim 1.
12. (Withdrawn) A linear or crosslinked polymer obtained by polymerizing a polymerizable mesogenic compound according to claim 1.
13. (Withdrawn) A linear or crosslinked polymer obtained by polymerizing a polymerizable mesogenic composition according to claim 11.
14. (Withdrawn) A polarizer, optical retardation or compensation film, alignment layer, colour filter, holographic element, liquid crystal display, PDLC, polymer

gel, polymer stabilized cholesteric texture (PSCT) display, adhesive, synthetic resins with anisotropic mechanical properties, cosmetic, diagnostic, liquid crystal pigment for decorative and/or security applications, or article for nonlinear optics or optical information storage comprising a compound according to claim 1.

15. (Withdrawn) A polarizer, optical retardation or compensation film, alignment layer, colour filter, holographic element, liquid crystal display, PDLC, polymer gel, polymer stabilized cholesteric texture (PSCT) display, adhesive, synthetic resins with anisotropic mechanical properties, cosmetic, diagnostic, liquid crystal pigment for decorative and/or security applications, or article for nonlinear optics or optical information storage comprising a composition according to claim 11.

16. (Withdrawn) A polarizer, optical retardation or compensation film, alignment layer, colour filter, holographic element, liquid crystal display, PDLC, polymer gel, polymer stabilized cholesteric texture (PSCT) display, adhesive, synthetic resins with anisotropic mechanical properties, cosmetic, diagnostic, liquid crystal pigment for decorative and/or security applications, or article for nonlinear optics or optical information storage comprising a polymer according to claim 12.

17. (Withdrawn) A multireactive polymerizable mesogenic compound according to claim 8, wherein alkyl is $-(CH_2)_c-$, with c being an integer from 1 to 12.